



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

$$\therefore c^2 x^2 = \frac{z^2}{1+z^2}. \quad \therefore z^2 = \frac{c^2 x^2}{1-c^2 x^2}, \quad z = \frac{cx}{\sqrt{1-c^2 x^2}}; \text{ i. e., } \frac{dy}{dx} = \frac{cx}{\sqrt{1-c^2 x^2}}.$$

$$\therefore dy = \frac{cx dx}{\sqrt{1-c^2 x^2}}, \text{ and } y = c \int \frac{x dx}{\sqrt{1-c^2 x^2}} = c \left(-\frac{1}{c^2} \sqrt{1-c^2 x^2} \right)$$

$= -\frac{1}{c} \sqrt{1-c^2 x^2}$. Squaring, $y^2 = \frac{1}{c^2} (1-c^2 x^2)$, or $c^2 (x^2 + y^2) = 1$, the equation of a circle.

Also solved by G. B. M. Zerr, and V. M. Spunar.

ERRATUM. In problem 264, Calculus, the proposer evidently meant

$$\left(\frac{d^2 \phi}{d\psi^2} \right)^2 \text{ instead of } \left(\frac{d^2 \phi}{d^2 \psi} \right)^2.$$

MECHANICS.

215. Proposed by R. D. CARMICHAEL, Anniston, Ala.

Determine the curve in a vertical plane along a chord of which a particle will slide under the force of gravity and the retardation of friction so that it will traverse the whole length of the chord in a time t which is independent of its direction as long as the upper end of the chord remains fixed. Discuss the result.

Solution by J. SCHEFFER, A. M., Kee Mar College, Hagerstown, Md.

Take the fixed end of the chord for the origin of the axes, that of x being horizontal, and that of y vertical. Let s denote the length of any chord drawn from the fixed point, and denote by θ the angle it makes with the horizon. Then, denoting the coefficient of friction by μ , we have $s = g(\sin \theta - \mu \cos \theta) \frac{t^2}{2}$, t being the time. If now, t is to be independent of θ ,

$\frac{s}{\sin \theta - \mu \cos \theta}$ must be a constant, say $= a$.

$\therefore \frac{\sqrt{x^2 + y^2}}{\frac{y}{\sqrt{x^2 + y^2}} - \frac{\mu x}{\sqrt{x^2 + y^2}}} = a$, or, $x^2 + y^2 = a(y - \mu x)$, a circle, the coordinates of the center of which are $-\frac{1}{2}a\mu$ and $\frac{1}{2}a$, and radius $= \frac{a}{2} \sqrt{1 + \mu^2}$.

Also solved by G. B. M. Zerr.

215. Proposed by HENRY WRITT, Genoa Junction, Wisconsin.

Suppose two centers of attractive forces A and B having a ratio 1 : 330,000, and influence reducing as the second power of the distance, i. e.,

R^{-2} . Then there is a point, P , on the line joining A and B , where $\frac{1}{AP^2} = \frac{330,000}{BP^2}$, or $1 : 575$, nearly. At this point the attractions are equal but opposite in direction along AB . It is proposed to find the surface through the point P which is the locus of the direction of the resultant of the two forces directed towards A and B , i. e., the locus of the diagonals of the minimum parallelogram of forces.

Solution by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

We are to find a surface such that every point on this surface is equally attracted by both centers of force.

Let A be the origin; (x, y, z) the coordinates of any point on the surface sought; $AB=a$.

$$\text{Then, } \frac{1}{x^2+y^2+z^2} = \frac{330000}{(a-x)^2+y^2+z^2}.$$

$$\therefore 329999(x^2+y^2+z^2) = a^2 - 2ax \text{ is the required surface.}$$

$$\text{This is a sphere radius } \frac{100a \sqrt{33}}{329999}, \text{ with center distant } \frac{a}{329999} \text{ from } A.$$

$$\text{When } y=z=0, x = \frac{a}{1 \pm 100\sqrt{33}} = \frac{a(1 \mp 100\sqrt{33})}{329999}.$$

$$\therefore P \text{ divides } a \text{ in the ratio } 1 : 575, \text{ nearly.}$$

217. Proposed by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

Given, the mean distance from earth to sun, 1.49×10^{15} centimeters; radius of the earth, 6.37×10^8 centimeters; velocity of the earth in its orbit, 2.96×10^6 centimeters per second; velocity of rotation of a point on the equator, 4.63×10^4 centimeters per second; mass of the earth, 6.14×10^{27} grams; find (1) the total energy of the earth in ergs; (2) the angular velocity of the earth on its axis; and (3) the angular velocity of the earth around the sun.

Solution by the PROPOSER.

Let m =earth's mass, v =its velocity of rotation, V =its velocity of translation.

$$(1) \text{ Energy of translation} = \frac{1}{2}mV^2. \quad \text{Energy of rotation} = \frac{1}{2}I\omega^2 = \frac{1}{5}mv^2.$$

$$\begin{aligned} \text{Total energy} &= m \left(\frac{V^2}{2} + \frac{v^2}{5} \right) = 6.14 \times 10^{27} (4.3808 \times 10^{12} + 4.2874 \times 10^8) \\ &= 269 \times 10^{38} \text{ dynes.} \end{aligned}$$

$$(2) r\omega = v, \text{ or } \omega = v/r = \frac{4.63 \times 10^4}{6.37 \times 10^8} = .0000727.$$

$$(3) RU = V, \text{ or } U = V/R = \frac{2.96 \times 10^6}{1.49 \times 10^{15}} = \frac{2}{10^9} = .000000002.$$